



P400MA and P400 Imagecheckers

Industrial Machine Vision



Panasonic Machine Vision systems

Overview

One-stop Machine Vision solutions

Thanks to our wide product range, from the easy vision sensor to the high-end system, we can offer you the most efficient solution for your particular Machine Vision application.



Vision sensor LightPix AE20

Our newly developed vision sensors combine the ease of use of a conventional photoelectric sensor with the inspection possibilities of an entry-level vision system. They are fast, reliable and cost-effective.



Compact Machine Vision systems

For more sophisticated demands, our compact Machine Vision systems range bears some impressive devices. A-series Imagechecker is one of the smallest of its kind and proves suitable for most of the standard inspection applications. Being equipped with two CPUs the PV310 sets a new standard with respect to function and speed.



Speed – Precision – Flexibility

The PV500 is Panasonic's most powerful stand-alone Machine Vision system. Its innovative hardware and software help to increase the efficiency of your automation and quality-control tasks. The all-round system is suitable for most of the typical industrial applications.



PC-based Machine Vision

P400MA and P400 Imagecheckers are the next generation of PC-based Machine Vision.

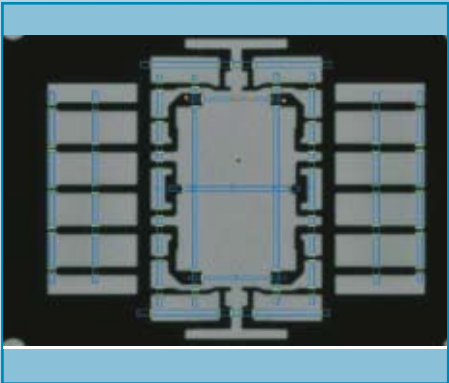
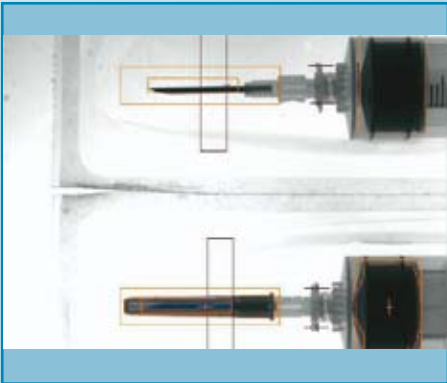
The systems are user-friendly and offer multiple functions for a wide range of sophisticated industrial inspection applications. High-end solutions materialize with a simple mouse click.



Imagechecker P400MA and P400

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Imagechecker P400MA and P400

Overview



P400

The P400 is a PC-based, multi-purpose, high-end Machine Vision system. It is the ideal inspection tool if your application requires:

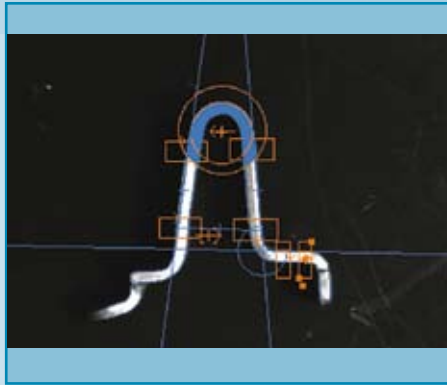
- High processing performance
- Various inspection functions
- Multi-camera processing with up to 12 cameras
- Extensibility in hard- and software



P400MA

The P400MA is a compact, PC-based Machine Vision system that comes with an all-round set of inspection tools and interfaces. It supports up to four cameras and uses exactly the same software and powerful inspection routines as the full-size system P400.





Extremely user-friendly.

Multi-purpose for a wide range of industrial inspection applications.

High performance and cost effective.

Expandable in hard- and software.

A reliable and flexible partner:

P400MA and P400 are complete PC-based vision systems. By selecting only high-quality components and developing a specially dedicated driver software, P400MA and P400 hardware and software have been optimized to yield maximum performance and reliability. Furthermore, these systems prove that ease of use and flexibility are not contradictory.

P400 Hardware (Page 6-9)



P400

P400MA



**Vision P400 Software
(Page 10-13)**





Imagechecker P400MA

Hardware P400MA



A reliable and compact system

The system's hardware and software are delivered fully configured, which saves you time setting up your system. Standardized hardware and several protective features ensure safe and reliable operation for many years – even in a harsh industrial environment.



Latest Vision technology

A careful combination of the latest computing technology and selected image processing hardware yields robust, fast and precise industrial Machine Vision. The system comes equipped with our Vision P400 software, which is based on one of the most advanced image processing libraries in the world. Expert knowledge is only one mouse click away.



Solid, powerful and reliable

P400MA offers the performance and stability of a dedicated, stand-alone and high-speed Machine Vision System. Nevertheless, it is 100% PC-compatible, thus combining all the merits and comforts of PC technology with industrially proven hardware.

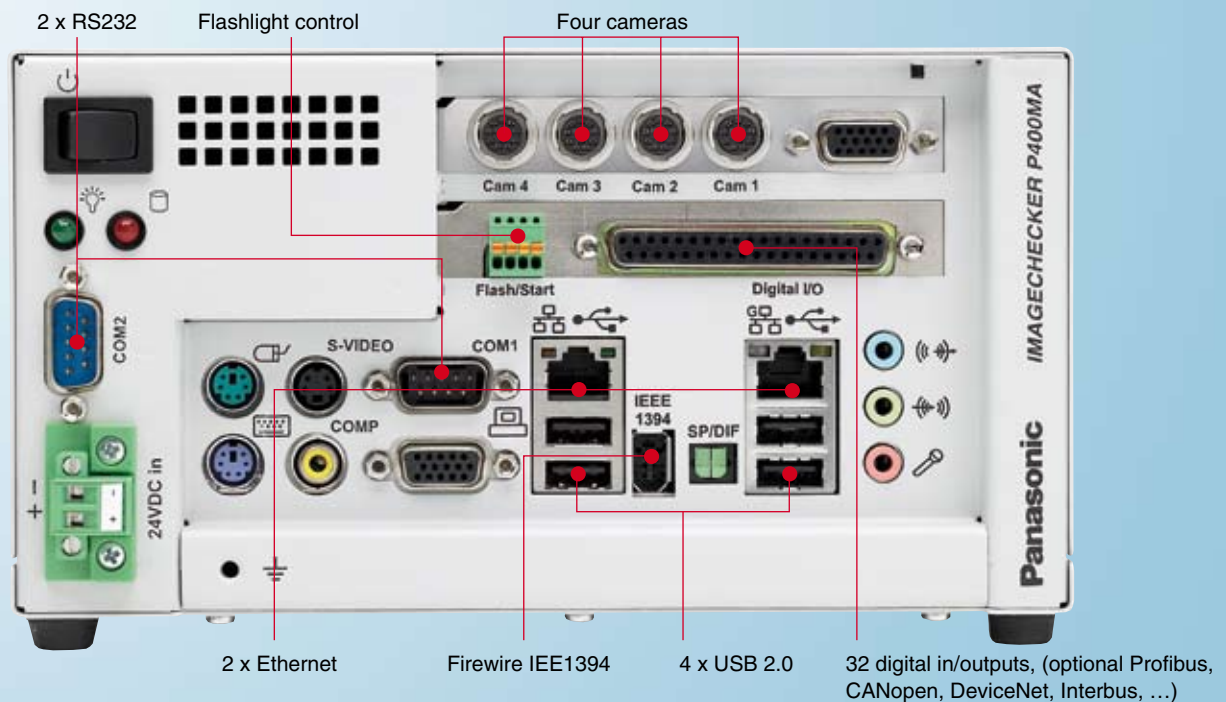




Highlights:

- Cost-efficient and precise checking with up to 4 CCD matrix cameras
- Several universal checkers that can be parameterized to handle your individual checking tasks – today and tomorrow
- Quick and easy creation and modification of qualitatively superior checking routines – without requiring expert knowledge
- Easy, time-saving integration into your overall plan and/or existing systems
- Designed for industrial applications
- Powerful, compact complete system at an attractive price

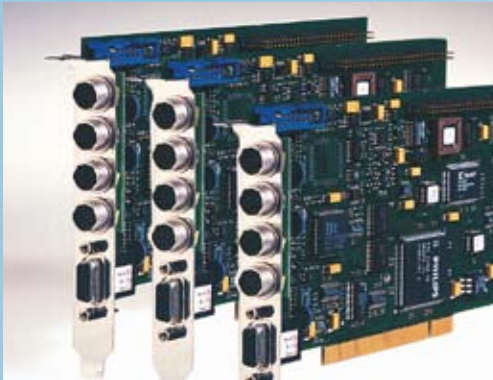
Interfaces:





Imagechecker P400

Hardware P400



Expandable

The system can be upgraded with up to two additional camera boards, which will be detected automatically by the software. P400 comes equipped with standard interfaces such as RS232, USB, Ethernet and even a digital I/O card. Furthermore, several unoccupied PCI slots offer added flexibility for your future needs.



Fast

The combination of carefully selected, fast hardware components and a specially developed driver software gives P400 real high-speed inspection capabilities. For example, extracting more than 1000 object features takes less than 50ms.



Designed with the customer in mind

The Imagechecker P400 is based on a powerful IBM-compatible industrial computer and offer several important and convenient features:

- Rugged metal housing with attachable 19" mounting brackets
- Lockable front door
- Changeable hard-disk drive for easy maintenance
- CD-RW drive
- Fan with removable dust filter
- 3-point attachment for all slot-cards
- keyboard and mouse can be connected on the front or back



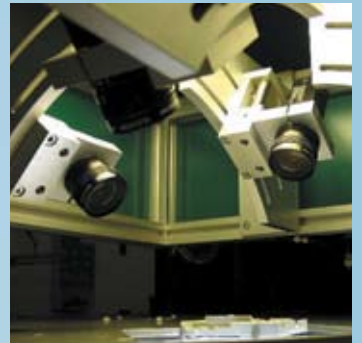


Highlights:

- Precise inspection with up to 12 CCD matrix cameras
- High performance and multi-purpose system
- Expandable thanks to modular concept
- Industrially proven with excellent connectivity
- Several outstanding features of Imagechecker P400MA

Multi-camera processing

The P400 is able to operate with up to 12 cameras in serial input mode or 6 cameras while capturing images in parallel. Users may select from different CCD-matrix camera types, from basic types to mega-pixel types.



Designed for use in industry

During the development of the Imagechecker P400, Panasonic attached great importance to designing a durable system suitable for industrial use. The P400 system has been thoroughly tested with regards to vibration and shock. Furthermore, each single P400 component has to pass an extended quality test before being used for the production of a system. Each single P400 system has to withstand a 48-hour test run. Due to its slot-CPU architecture, servicing a P400 system is easy.



Safe investment

In times of shortened product life cycles, protecting your investment long-term becomes increasingly important. P400MA flexible architecture and use of high-quality, standard component guarantees this: soft- and hardware can be easily updated and upgraded at any time.





Imagechecker P400MA and P400

Vision P400 – Graphical user interface

Menu bar

Here all basic settings can be made, e.g. opening and saving an application, selecting the frame grabber, specifying a password, processing a spreadsheet, etc.

Vertical toolbar

The icons on the left-hand bar are used to select a checker. With an icon from the right-hand bar, the checker window shape can be selected. The size and position of the window defined can be modified at will using the mouse.

Spreadsheet

The spreadsheet is a special dialog box for displaying and optimizing the individual parameters and results. The drag & drop facility can be used to optimize limit values. Statistics can be prepared and checking results assigned to the interfaces. Action commands assist in analysing test objects which have been recognized as being faulty.

Status bar

Information about the effect of selecting a menu item or icon is provided here.

The screenshot shows the Vision P400 software interface. The main window displays a camera feed of a mechanical part with several blue rectangular regions of interest (ROIs) and a green crosshair. A measurement value '531.23 mm' is displayed in green. The interface includes a menu bar at the top with options like Application, System Settings, Execution Groups, Edit, View, Camera, Checker, Spreadsheet, Run Mode, Window, and Help. A vertical toolbar on the left contains various icons for selecting checkers and modifying window shapes. A 'Workflow' panel on the left lists categories like System Setup, Application, Camera, Execution Groups, Evaluation and Output, and Manuals. A 'Spreadsheet' dialog box is open at the bottom right, showing a table of results and formulas. The status bar at the bottom indicates 'For Help, press F1'.

	Result Name	Value	Result (C)
Results	Start		
	CM[1;1]point_X_Coordinate_1	300.34	300.34
	CM[1;1]angle_1	0.3	0.3
	DI[1;1]numberOfJudgedObjects	0	0
	FE[1;1]areaSize_1	1739	1739
Formulas	FE[1;2]areaSize_1	1856	1856
	End		
	Start		
	ArithExpr0	330.34	330.34
	BoolExpr0		
	IfCase0	1	1
	End		



Horizontal toolbar

Includes various icons, e.g. to start the application or test the checkers. From here the inspection program can be started manually, and helpful diagnostic tools such as an error display or interface monitors can also be launched.

Image area

In this window the video image of the camera in question is displayed. The display can be toggled between the direct live image and the saved image. The display makes use of a 256-step gray scale.

Name	Dependencies	Time[ms]	Comment
CM[1;1]		9	
FE[1;1]		0	
FE[1;2]		0	
DI[1;1]		2	
DI[1;2]		2	
ED_GP[1;1]		0	
ED_GP[1;2]		0	
ED_GP[1;3]		0	
ED_GP[1;4]		0	
OCR[1;1]		0	
OCR[1;2]		0	
CR[1;1]		49	
IC[1;1]	DI[1;1] DI[1;2]	0	

No.	Name	Comment
1	Camera 1, Sequence 1	

Calib.	Lower Limit	Upper Limit	Min Result	Max Result	Average
0	300.34	300.34	300.34	300.34	300.34
0	0.3	0.3	0.3	0.3	0.3
0	0	0	0	0	0
0	1700	1739	1739	1739	1739
0	1856	1856	1856	1856	1856
0	0	330.34	330.34	330.34	330.34

Sequence scroll bar

Provides an overview of the checkers set. This is also where the order in which the checkers run can be specified, and where the user can jump to the corresponding dialog box of the checker by simply clicking on the bar.

Checker dialog box

This is where limit values are defined, results retrieved, or even filter settings made. Each checker has its own dialog box and thus can be adjusted individually to the application.

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www.panasonic-electric-works.com



Imagechecker P400MA and P400

Vision P400 Software – Features



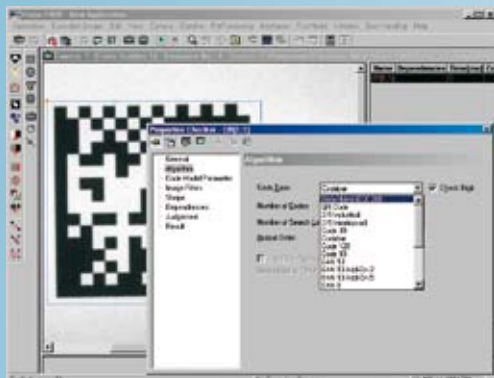
Two systems – one software

Although P400MA and P400 are different with respect to hardware features, their “intelligence” – the Vision P400 software – is the same. Thus users benefit from a uniform GUI with the same range of inspection tools in both systems and a scalable hardware power. Vision P400 inspection programs are rendered interchangeable between both devices.



Fully equipped

Vision P400 includes a wide range of checkers which are ready-to-use inspection routines adjustable with a few mouse clicks. Presence checking, precise 2D measurement, object identification, position detection, shape/contour matching and OCR are just a few examples from Vision P400’s “toolbox” offering a precise, fast and robust solution for the majority of visual inspection tasks.



Easy to use

The Vision P400 software sets a new standard in user-friendliness. It is mostly self-explanatory and runs under the known Windows operating system. Therefore many users will already be familiar with basic procedures. With the aid of icons, toolbars and status displays, even sophisticated applications can be configured quickly, securely and efficiently.

No previous programming knowledge is required.

- Highlights:**
- Fast and easy visual setup
 - Large amount of ready-to-use inspection tools for almost any application
 - Customizable

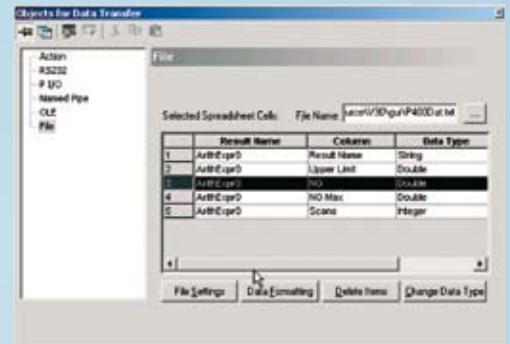
Pana

Vision
P400



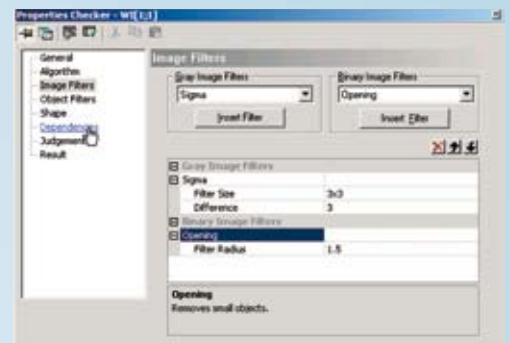
Communication

In addition to the standard hardware ports (serial interface, parallel I/Os), Vision P400 supports two software interfaces – named pipe and OLE automation (ActiveX®). They enable Vision P400 to communicate with other Windows application or to realize customized user interfaces for your application. Additionally, special actions such as storing NG-images, output warning messages, etc. can be easily realized using Vision P400's Action command button.



Stability

Vision P400 offers many useful image pre-processing functions such as an exposure adjustment, which compensates potential fluctuations in environmental brightness. The position/rotation adjustment ensures correct inspection if the object's position varies. Several filter functions help to optimize the image quality prior to the real evaluation. All these functions significantly improve inspection stability for critical applications.



Offline parameterization

To create a Vision P400 inspection program, it is not mandatory to have a real P400MA/P400 system at hand. Using our free simulation software, any PC or notebook with MS Windows can be used to set-up, test or to optimize a Vision P400 inspection routine. This simulation software offers all major functions of the real version.





Imagechecker P400MA and P400

Inspection functions

Object identification and position detection made easy

Vision P400 includes several algorithms which allow fast, reproducible and precise recognition, identification and location of objects. Our powerful Contour-Matching Checker is an especially impressive tool for such inspection tasks. It evaluates objects based on previously trained models, judging geometric information instead of pixel patterns, thereby achieving revolutionary stability and detection speed. Furthermore this algorithm can handle all those disruptive factors, which often disqualify conventional inspection methods for the real factory environment: fluctuating illumination, changing object appearance, touching and overlapping objects.



Gray value image



Contour template

Inspection and verification of characters, codes and prints

P400 systems offer various tools to check the quality and completeness of complete prints, to read strings of characters (Optical Character Recognition), to verify strings (Optical Character Verification) or to read a variety of different codes. The employed techniques guarantee high reliability and precision even under severe inspection conditions.

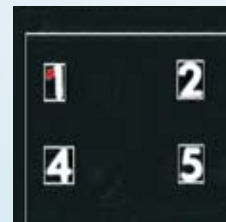
OCR/OCV

A powerful tool to read and verify characters, strings and symbols. We have expanded the functionality of this checker. Now, also rotated or even curved strings can be read.



Print inspection

Typically blurred or incomplete imprints have to be detected. P400 is able to localize quality deviations which can barely be seen by the human eye.



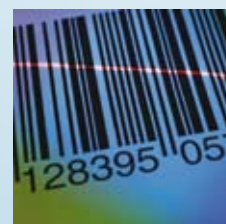
2D code reading

This newly developed Checker reads 2D codes such as Datamatrix, ECC200 and QR code. Regardless of whether the codes are randomly twisted or serious changes in brightness occur, this powerful checker will read them reliably. Setting the checker is as easy as drawing a rectangle.



Barcode

Almost any barcode can be read with this tool. 2/5 Industrial, Code 39/93/128, EAN 13, EAN 8, UPC-A/E, and Pr Pharma Code are just a few examples.

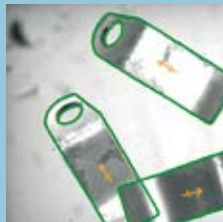


Imagechecker P400MA and P400

Inspection functions

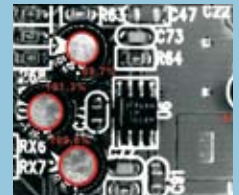
Impervious to fluctuations in illumination

Taking into account real factory floor environments this inspection tool is not influenced by changes in ambient light or even variations in the object's appearance.



Scaling permissible

No matter if the parts vary in size or change their shape slightly, the Contour Matching Checker will find them reliably. Tolerances can be set from 50% to 200%.



Accepts missing/overlapping objects

Object can touch or even overlap rendering costly fixtures for separation unnecessary.



Permitted rotation

Object identification will be performed, regardless of whether objects are rotated.



Measurement, sorting, counting...

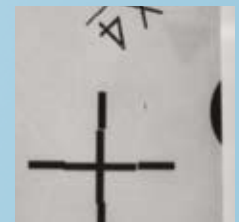
2D Measurement

No matter which kind of measuring has to be performed, Vision P400 offers the right tools: distances, radii, areas, perimeters, roundness and much more. Depending on the field of view and the camera connected, μm -resolution can be achieved.



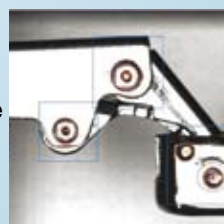
Positioning

Using special algorithms, P400 systems reach a resolution of up to 1/2000 pixel for positioning applications. The teach-in procedure merely requires that you show the system a reference image.



Assembly inspection

Five different ready-to-use algorithms are available to check whether the right part is at the right position, from simple presence checking applications of single parts to inspection of complex component assemblies.



Sorting, counting, parts recognition

Even objects which look quite similar can be distinguished reliably and quickly. For example, our Feature Extraction checker evaluates up to 20 object criteria (such as perimeter, area, center of gravity, etc.) in only 22ms.





Imagechecker P400MA and P400

Inspection functions

Checker	Applications	Example
Window Checker 	<ul style="list-style-type: none"> ■ Presence check ■ Sorting ■ Area measurement ■ Surface inspection ■ Parts recognition 	 <i>All rolls present?</i>
Binary Edge Detection 	<ul style="list-style-type: none"> ■ Fast measurement of length and distance ■ Fast angle measurement ■ Presence checking 	 <i>Width of tracks correct?</i>
Gray Value Edge Detection 	<ul style="list-style-type: none"> ■ High accuracy measurement of length and distances ■ High accuracy angle measurement ■ Coplanarity check ■ Surface inspection 	 <i>All dimensions within range?</i>
Difference Checker 	<ul style="list-style-type: none"> ■ Print checking ■ Punch checking ■ Quality check of injection moulded parts ■ Surface inspection 	 <i>Print okay?</i>
Feature Extraction 	<ul style="list-style-type: none"> ■ Counting objects ■ Presence check ■ Position detection ■ Roundness check ■ Parts recognition 	 <i>Benching radius correct?</i>
Optical Character Recognition (OCR) 	<ul style="list-style-type: none"> ■ Read, identify and verify: <ul style="list-style-type: none"> □ Plain writing □ Laser prints/thermal prints □ Logos ■ Object recognition 	 <i>Correct lot number?</i>
Code Reader 	<ul style="list-style-type: none"> ■ Read codes: <ul style="list-style-type: none"> □ Barcodes: 2/5 Industrial, Code 39/93/128, EAN 8, EAN 13, UPC-A/E, Pr Pharma code ■ 2D Codes: ECC200, QR-Code 	 <i>Contents of the code?</i>
Contour Matching 	<ul style="list-style-type: none"> ■ Position detection (0-360°) ■ Object identification ■ Presence check 	 <i>Position of the pieces?</i>

Imagechecker P400MA and P400

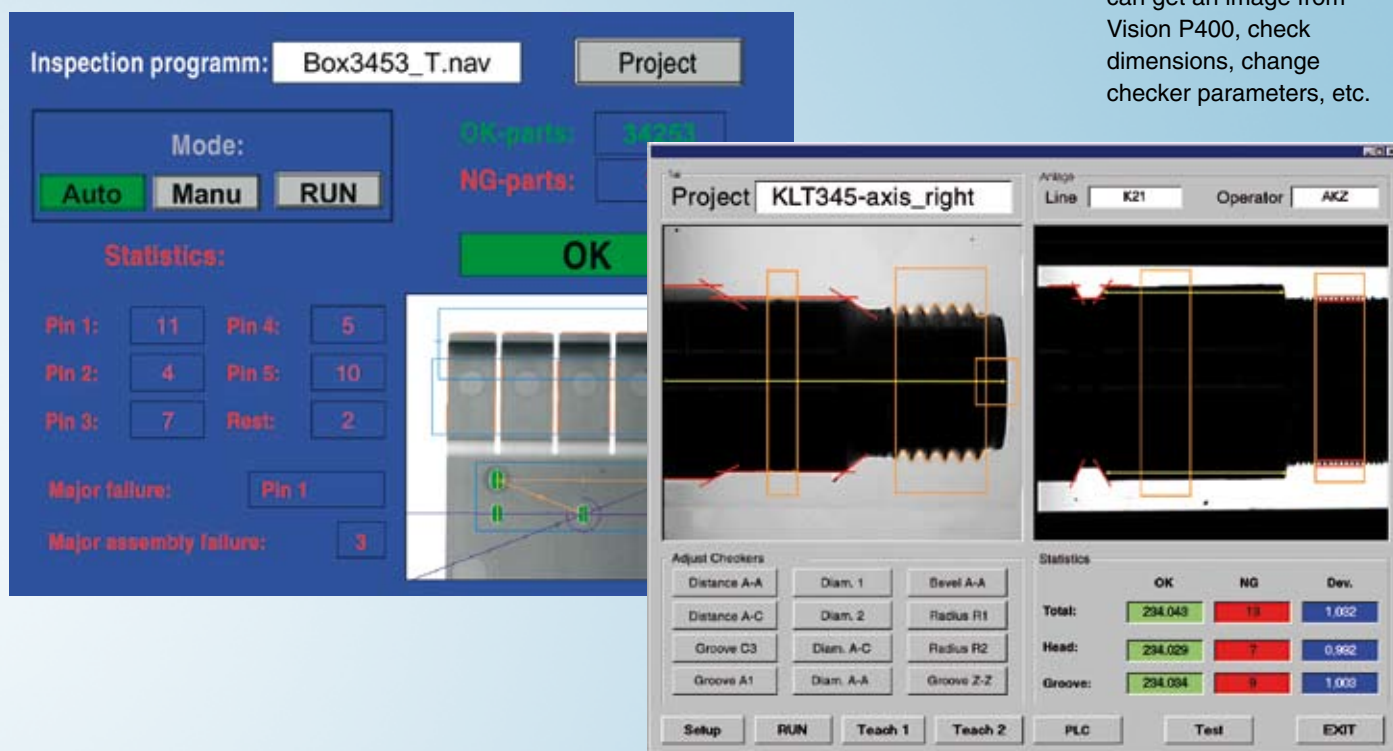
Customization

Tailor-made user interface via ActiveX®

ActiveX controls use Microsoft's COM technologies to communicate with other MS Windows applications such as MS Excel or custom programmed software clients. The implementation of P400's ActiveX Control is well supported by almost every open-standard programming language, e.g. Visual Basic or Visual C++. Thus, creating a specific and individual user interface for Vision P400 can be easily realized.

Example:

A Visual Basic Client which can get an image from Vision P400, check dimensions, change checker parameters, etc.



Supported features:

Receive images from Vision P400

- These images can contain individual graphical elements such as markers or indicators.

Receive inspection results from Vision P400

- Inspection results can simply be displayed or used for further calculation, e.g. statistics.

Control Vision P400

- All necessary synchronization signals can be sent and received.

Change Checker parameters

- For example, change the inspection region of a checker, change filter settings of a checker.

More than 50 ActiveX methods to adjust Vision P400 to your needs

- Save other applications, set passwords, change applications, change inspection tolerances and much more.



Imagechecker P400MA and P400

Specifications

P400MA controller		
Part no.	ANPMA4310V1	ANPMA4311V1
Processor	Intel Celeron M440, 1.86 GHz	
Cameras	Max. 4 CCD cameras/serial image grabbing Max. 2 cameras in parallel/parallel image grabbing	
Drives	Hard disk, min. 40GB S-ATA Internal CF card drive equipped with card (2GB or more)	
Interface	Without parallel I/O card	Parallel I/O card included
	–	16 x digital inputs/16 x digital outputs (opto-decoupled, NPN/PNP)
	2 x serial RS232C, 4 x USB 2.0, 1 x Firewire (IEEE1394), 1 x 10/100 Base-TX Ethernet, 1 x 10/100/1000 Base-T/TX Ethernet	
Housing	Industrial metal enclosure with mounting brackets Dimensions: 220 x 206 x 110mm (L x W x H)	
Supply voltage	24VDC \pm 10%	

P400 controller	
Part no.	ANPC442VxCED
Processor, RAM	Slot CPU with Intel Pentium processor, min. 512MB
Cameras	Max. 12 CCD cameras/serial image grabbing Max. 6 CCD cameras/parallel image grabbing
Drives	Removable hard-disk 20GB or more 3.5" floppy drive, 1.44MB DVD-RW drive
Interface	2 x serial RS232C 1 Centronics interface 1 digital I/O card: 16 inputs/16 outputs 2 x USB 2 x 12VDC power supply (each 400mA) Dual LAN Port 10/100 Mbit Option: PROFIBUS interface
Housing	Industrial enclosure with fan and lockable front door Dimension (L x W x H) : 440 x 455 x 177mm 19" rack-mounting kit included
Supply voltage	230VAC

Camera	Standard	Megapixel	Double-speed	Double-speed megapixel
Part no.	ANPC831D	ANPC834D	ANPC836D	ANPC837D
Type	Progressive scan, 1/3" CCD chip	Progressive scan, 1/2" CCD chip	Double-speed progressive scan, 1/3" CCD chip	Double-speed progressive scan, 1/3" CCD chip
Resolution (H x V)	636 x 480 pixel	1380 x 1035 pixel	636 x 480 pixel	1024 x 768 pixel
Shutter speed	1/15 to 1/10,000s	1/30 to 1/10,000s	1/125 to 1/10,000s	1/125 to 1/10,000s
Lens mount	C-Mount			
Dimensions (L x W x D)	29 x 44 x 66mm	29 x 44 x 66mm	29 x 29 x 42mm	29 x 29 x 42mm

Panasonic Machine Vision

Related products



Vision sensor AE20 and 2D code reader PD60/65

Our Vision Sensor LightPix combines the ease of use of a conventional photoelectric sensor with the inspection possibilities of an entry-level Machine Vision system. PD60/65 is specialized on reading 2-dimensional codes such as Datamatrix ECC200 code and QR-code.



Compact Machine Vision systems Imagechecker A100/A200

For more sophisticated applications, the A-Series is the next step. With dimensions of just 120 x 40 x 70mm, the A-Series Imagechecker is one of the smallest of its kind. It allows high-speed, dual-camera processing (A200) with a robust and mature stand-alone hardware.



Color image processing system AX40

Once color-related product failures require detection, AX40 is the perfect solution. It evaluates the images of up to two cameras with respect to minute color differences, checks objects' features, measures dimensions, compares patterns and much more.



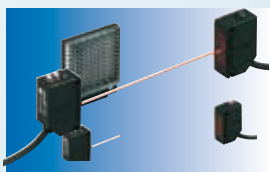
High-speed compact system PV310

Being equipped with two CPUs, PV310 is the ideal multi-purpose system for high-speed inspection applications. E.g., a smart-matching checker with a 128 x 128 pixel template will be executed in less than 4ms.



High-performance in compact class system PV500

The PV500 is Panasonic's most powerful stand-alone Machine Vision system. Its innovative hardware and software helps to increase the efficiency of your automation and quality control tasks. The all-round system is suitable for most of the typical industrial applications.



Sensors

SUNX is the brand name for our sensor products. Whatever type of sensor is required, our wide product range offers you the right solution.



Laser Marking systems

Accurate and distinct non-removable marking of almost any product can be achieved with our Laser Markers. We offer various CO₂ and FAYb models ranging from 12 to 30 Watt.

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▶ Poland	Panasonic Electric Works Polska sp. z o.o.	Al. Krakowska 4/6, 02-284 Warszawa, Tel. +48 (0) 22 338-11-33, Fax +48 (0) 22 338-12-00, www.panasonic-electric-works.pl
▶ Portugal	Panasonic Electric Works España S.A.	Portuguese Branch Office, Avda Adelino Amaro da Costa 728 R/C J, 2750-277 Cascais, Tel. +351 214812520, Fax +351 214812529
▶ Spain	Panasonic Electric Works España S.A.	Barajas Park, San Severo 20, 28042 Madrid, Tel. +34 913293875, Fax +34 913292976, www.panasonic-electric-works.es
▶ Switzerland	Panasonic Electric Works Schweiz AG	Grundstrasse 8, 6343 Rotkreuz, Tel. +41 (0) 41 7997050, Fax +41 (0) 41 7997055, www.panasonic-electric-works.ch
▶ United Kingdom	Panasonic Electric Works UK Ltd.	Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6 LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, www.panasonic-electric-works.co.uk
North & South America		
▶ USA	PEW Corporation of America	629 Central Avenue, New Providence, N.J. 07974, Tel. 1-908-464-3550, Fax 1-908-464-8513, www.pewa.panasonic.com
Asia Pacific/China/Japan		
▶ China	Panasonic Electric Works (China) Co., Ltd.	Level 2, Tower W3, The Towers Oriental Plaza, No. 2, East Chang An Ave., Dong Cheng District, Beijing 100738, Tel. (010) 8518-5988, Fax (010) 8518-1297
▶ Hong Kong	Panasonic Electric Works (Hong Kong) Co., Ltd.	RM1205-9, 12/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong, Tel. (0852) 2956-3118, Fax (0852) 2956-0398
▶ Japan	Matsushita Electric Works, Ltd.	1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan, Tel. (06) 6908-1050, Fax (06) 6908-5781, www.mew.co.jp/e-acg/
▶ Singapore	Panasonic Electric Works Asia Pacific Pte. Ltd.	101 Thomson Road, #25-03/05, United Square, Singapore 307591, Tel. (06255) 5473, Fax (06253) 5689